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SOLVENT REGENERATION OF TNT LADEN CARBON,(U)
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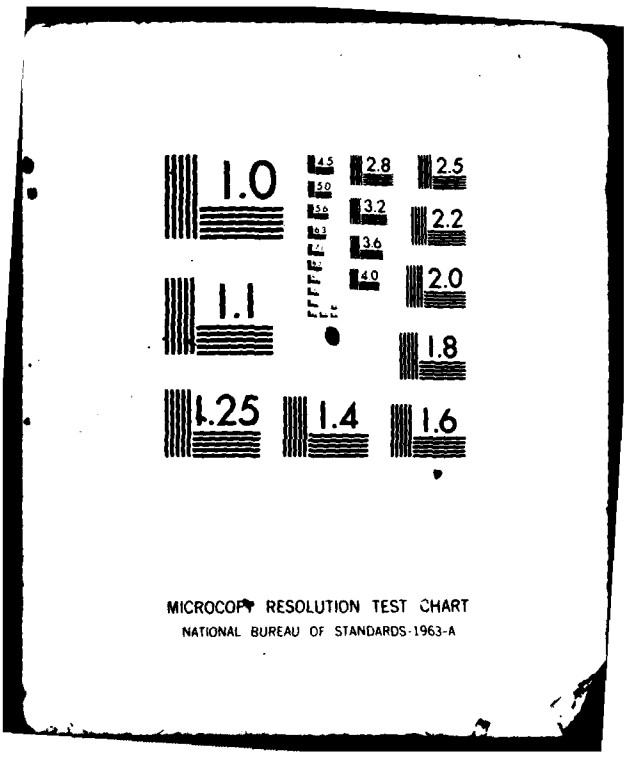
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SOLVENT REGENERATION OF TNT LADEN CARBON

Technical Report No. 228

By

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Department Head Approval: J. R. Polson

Additional work authorized as a part of MM&T Project 5734114, Task 22, "Solvent Regeneration of Carbon from TNT Removal Columns"

I. INTRODUCTION

Several installations have reported varying results on what effect solvents have in regenerating activated carbon, contaminated with TNT. This report is concerned with a pilot study which requested by Lt. Dustin, Edgewood Arsenal and authorized as a part of Project 5734114 by I. Forsten, Picatinny Arsenal. ~~This work~~ defines the actual ability of acetone, methanol and toluene to regenerate activated carbon, so that it can be reused to adsorb TNT from waste process water.

II. DISCUSSION

This experiment was accomplished using a two thousand gallon tank as the source of pink or contaminated water, one forty-eight inch by four inch stainless steel column and Calgon Filtrasorb #300 activated carbon. These items are shown in photos one through three respectively. Stainless steel screens were placed in the top and bottom of the column to eliminate migration of carbon from the column.

The procedure, as follows, was used in all three experiments with one exception which will be noted later.

II. DISCUSSION (CONT.)

The column was charged with 8.4 lbs. of activated carbon pre-wetted with water to prevent channeling by decreasing air pockets. A known concentration of TNT water was passed through the column from the bottom to top, at a constant rate of 20 gallons per hour. The concentration of TNT in the tank was monitored often to assure the total load of TNT on the activated carbon would be known. The flow was continued until a 1 ppm breakthrough occurred. After breakthrough was obtained, the solvent regeneration process was performed by passing the solvent in through the column from top to bottom in a back-flush manner. This was done to use the mechanical flushing as well as solvent action. This method allowed for complete drainage of solvent from the column. After as much TNT as possible was dissolved and washed, the activated carbon was recontaminated as previously described.

In the case of toluene, an extra step was introduced in order to compensate for its immiscibility in water and avoid a premature breakthrough. We flushed the toluene out of the column with methanol.

The following three tables list the parameters and results of each test.

TABLE I

ACETONE REGENERATION DATA

Influent Concentration	222 ppm
Hydraulic Loading	20 gallons per hour
Weight of Carbon	8.4 lbs.
Carbon Bed Dimensions	33.6 in. ht. by 4 in. dia.
Breakthrough Volume	650 gallons
TNT Adsorbed at Breakthrough	1.20 lbs.
Regeneration Volume	51 gallons
Weight of TNT Removed during Regeneration	1.10 lbs.
Recontamination Breakthrough Volume at 195 ppm	320 gallons
Amount of TNT Adsorbed after Regeneration	0.52 lbs.

TABLE II

METHANOL REGENERATION DATA

Influent Concentration	258 ppm
Hydraulic Loading	20 gallons per hour
Weight of Carbon	8.4 lbs.
Carbon Bed Dimensions	33.6 in. ht. by 4 in. dia.
Breakthrough Volume	600 gallons
TNT Adsorbed at Breakthrough	1.29 lbs.
Regeneration Volume	51 gallons
Weight of TNT Removed during Regeneration	0.45 lbs.
Recontamination Breakthrough Volume at 191 ppm	270 gallons
Amount of TNT Adsorbed after Regeneration	0.43 lbs.

TABLE III

TOLUENE REGENERATION DATA

Influent Concentration	330 ppm
Hydraulic Loading	20 gallons per hour
Weight of Carbon	8.4 lbs.
Carbon Bed Dimensions	33.6 in. ht. by 4 in. dia.
Breakthrough Volume	425 gallons
TNT Adsorbed at Breakthrough	1.26 lbs.
Regeneration Volume	56 gallons
Weight of TNT Removed during Regeneration	0.36 lbs.
Recontamination Breakthrough Volume at 106 ppm	450 gallons
Weight of TNT Adsorbed after Regeneration	0.40 lbs.

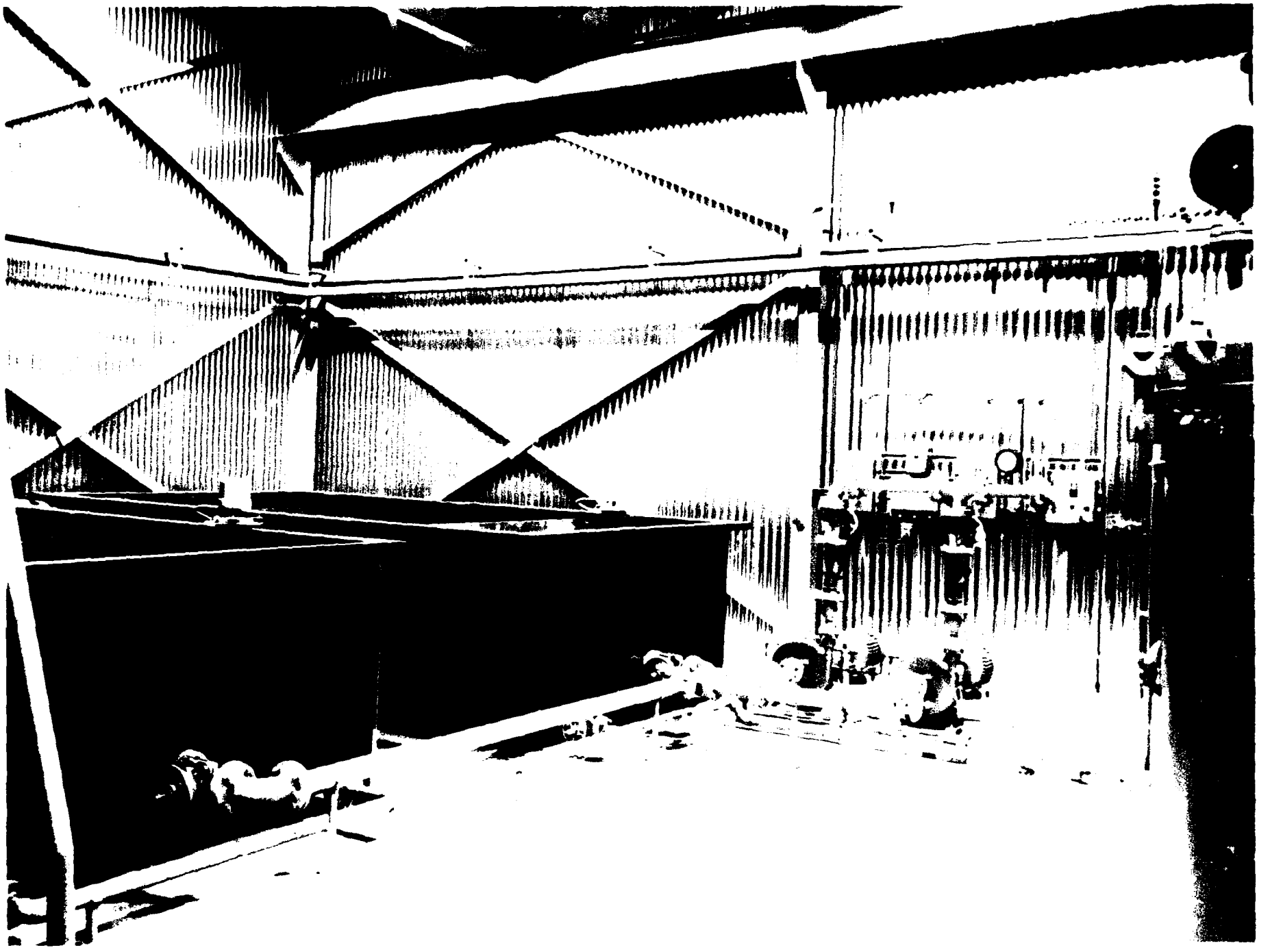
III. OBSERVATION AND CONCLUSIONS

This project disclosed that acetone is the best solvent for dissolving TNT adsorbed by activated carbon. This is shown in Graph "A".

Information garnered during these tests follow the patterns of the actual solubility of TNT in the various solvents. However, channeling, contact time and physical attraction of the activated carbon for TNT are probable causes of the discrepancy between the results and solvent capacity to dissolve TNT.

The results of the pilot study also implies that regeneration does not reactivate the carbon, but does allow for a certain amount of TNT to be readsorbed. This salient point is illustrated in Graph "B". There exists the possibility of increasing the efficiency of the process by heating the solvents and redistillation of the solvent for reuse. However, the feasibility of solvent regeneration of activated carbon is questionable.

Due to recontamination breakthrough volumes of less than 50% and availability of suitable solvents, more than one regeneration per solvent was not feasible or possible.

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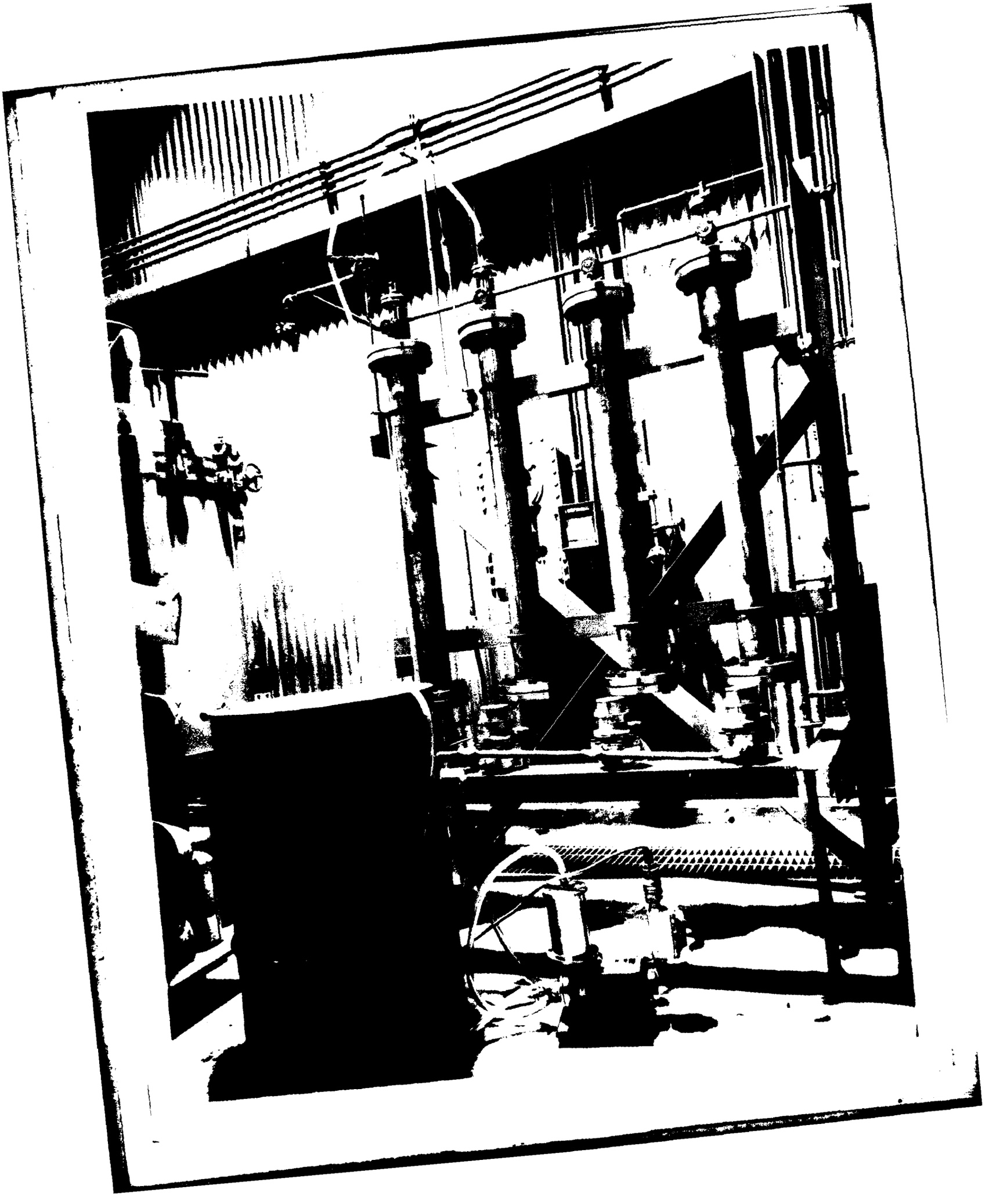
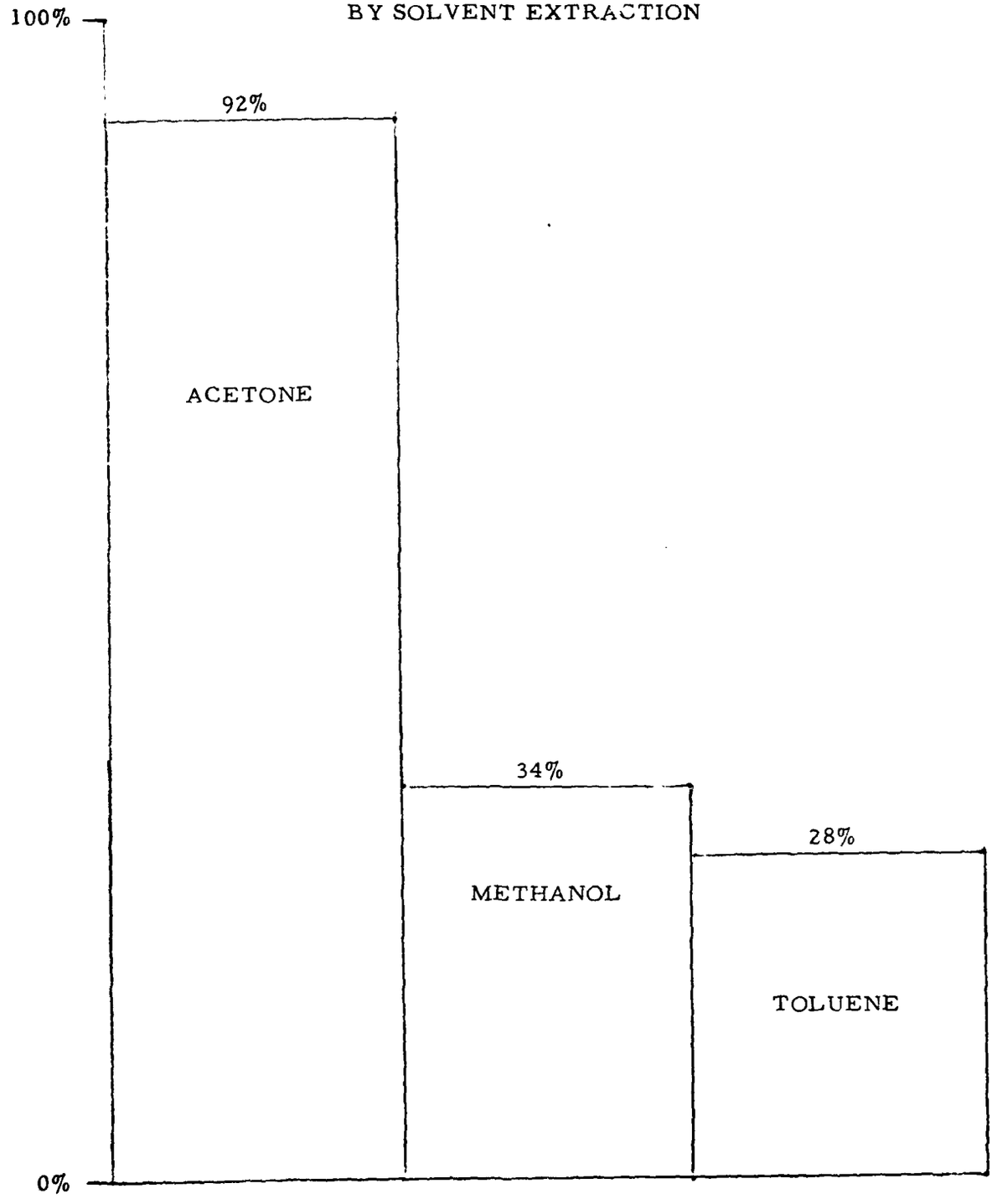


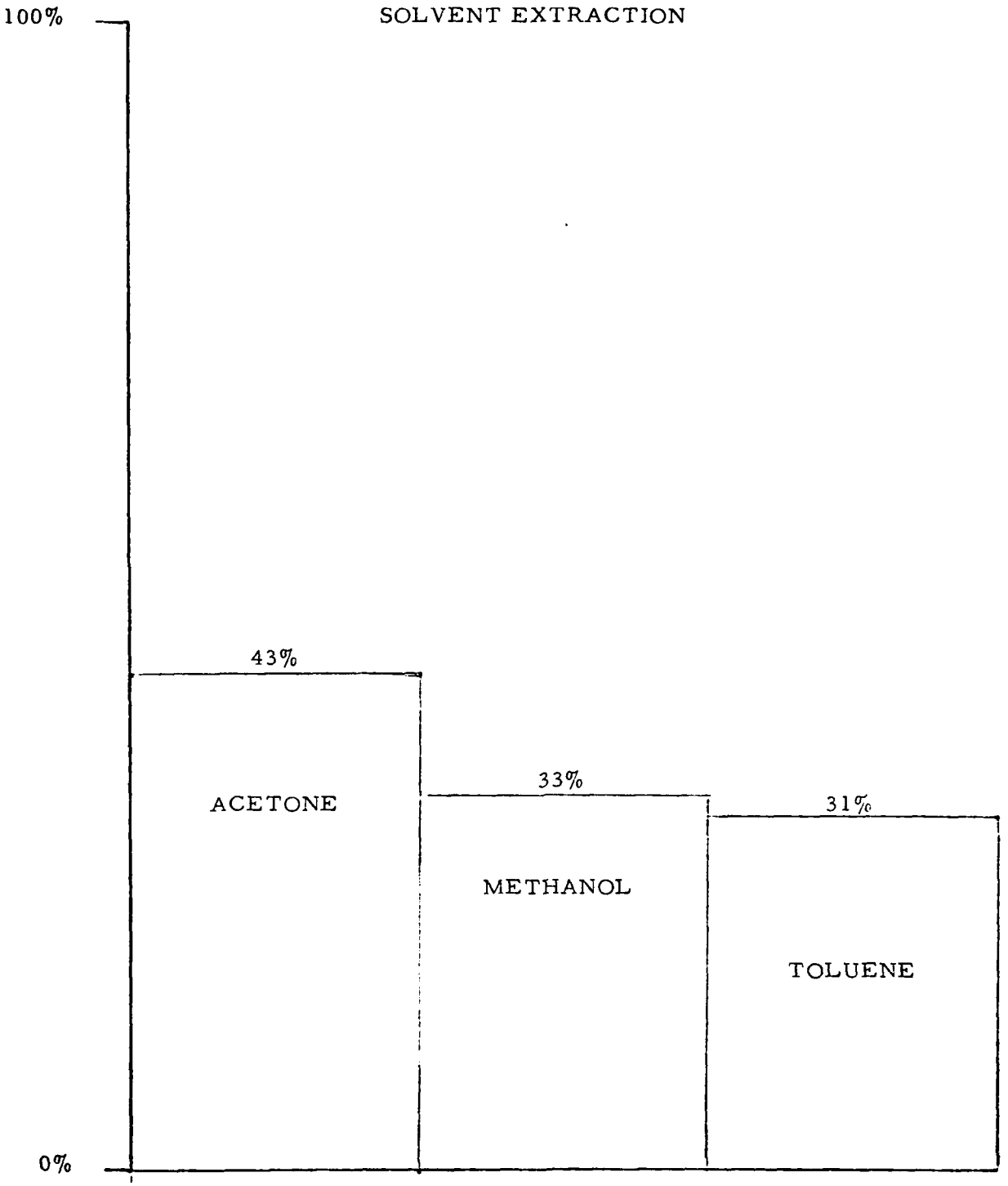
GRAPH "A"

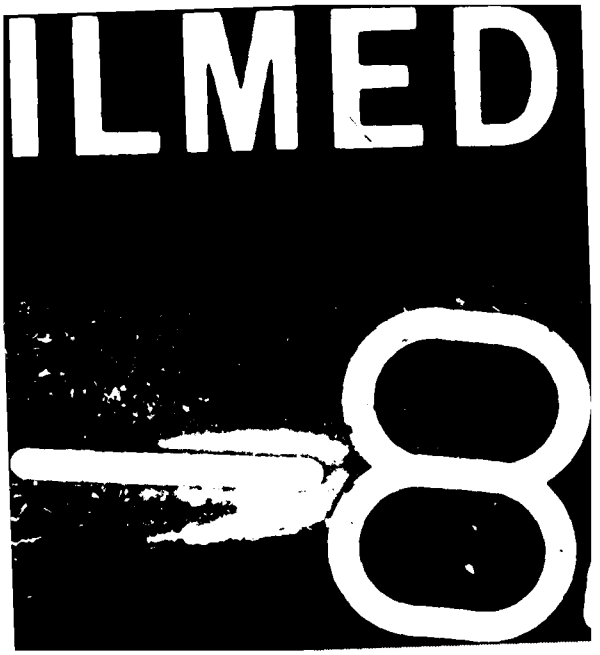
PER CENT OF TNT
REMOVED FROM COLUMN
BY SOLVENT EXTRACTION



GRAPH "B"

COLUMN REGENERATION EFFICIENCY
PER CENT TNT ADSORBED AFTER
SOLVENT EXTRACTION

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